New Vascular Plant Species Discoveries in the Northern Colorado Plateau Network: 2009 Update

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Above: *Polystichum scopulinum* from Spry Canyon, Zion National Park, photographed by Steve McKee in 2007. This species was previously considered historical in the park as it had not been relocated since the 1960s.

Table of Contents

Tables

Figures

Introduction

In late 2008 and early 2009, the National Park Service published revised vascular plant species checklists for each of the 16 park units in the Northern Colorado Plateau Network (NCPN) (Fertig 2009a, 2009b, 2009c, 2009d, 2009e, 2009f, Fertig and Alexander 2008, 2009, Fertig and Atwood 2009, Fertig and Kyte 2009, Fertig and Topp 2009, Fertig et al. 2009a, 2009b, Hogan et al. 2009, 2009a, 2009b). These reports were based on a review of existing herbarium collections and new field work associated with rare plant surveys, weed monitoring, vegetation mapping, and general floristic studies conducted from 2004-2007.

Additional studies have taken place in many parks since 2008 and new plant species continue to be discovered or relocated. In 2008 alone, 62 new species were documented in nine NCPN park units (Fertig 2008, Fertig et al. 2009).

The following report describes new discoveries and changes in status based on field work and data mining conducted for network parks in 2009. The largest number of new species reports comes from rare plant and post-fire vegetation monitoring studies in Zion National Park. New discoveries have also been made in Arches National Park, Black Canyon of the Gunnison National Park, Capitol Reef National Park, Cedar Breaks National Monument, Curecanti National Recreation Area, Dinosaur National Monument, Natural Bridges National Monument, and Timpanogos Cave National Monument by park staff, network scientists, and outside researchers.

This report is intended as an addendum to the annotated checklists published in 2008-09. Additional discoveries are likely in the coming years, and we will attempt to keep the species lists as current as possible with future addenda.

Methods

Using the NPS technical series checklists as a baseline, we were able to determine whether species identified in plots or found during field surveys were new to a park or represented a change in status (such as a species formerly considered historical or reported*). Additional species reports were generously provided by park and network biologists and outside researchers, along with supporting data in the form of herbarium specimens, photographs, or location information. Whenever possible, new specimens were corroborated by one of us or an outside expert. Changes in species status (present, reported, historical, or potential) were made to a master excel spreadsheet database for each network park and are summarized in tables 1 and 2. NCPN staff will ultimately use these data to update the digital NPSpecies database for each park unit in the network.

*Historical species are defined as those which have not been relocated in a park since 1970, while reported species are cited for a park in the literature but do not have an accompanying voucher specimen or photograph for positive confirmation.

Species nomenclature for this update continues to follow the most current state flora or identification manual (Weber and Wittmann 2001 for Colorado parks and Welsh et al. 2008 for Utah parks). Unfortunately, no single reference yet covers the entire flora of the southwest or intermountain region (although the 8th and final volume of the *Intermountain Flora* should be completed in 2011 and the multi-volume *Flora of North America* recently passed the half-way point). Specialists may be disappointed in seeing their favorite taxonomic group treated too conservatively or too liberally by the current state floras. The decision to follow state floras was made at the onset of this project in 2004 in the belief that park staff and researchers would be most familiar with the names and taxonomic concepts being applied at the state level. Future name changes, reduction of species to synonymy, elevation of varieties to full species status, and alteration in family concepts will need to be addressed, especially as the *Intermountain Flora* and *Flora of North America* are completed and can be adopted as alternatives to state-based floras.

Results

Based on 2009 fieldwork and data mining, 51 new species were documented as present and 6 new species were reported for 9 of the 16 units in the Northern Colorado Plateau Network (Table 1). At least 22 of these new species had previously been listed as potential or falsely reported for their park. Zion National Park had the greatest increase in its flora, with 33 species confirmed or reported as present for the first time.

Another 19 species that were formerly listed as reported or historical for their park were documented as being present in 2009 (Table 2). Nearly all of these new discoveries came from Zion National Park, although two species were also rediscovered in Dinosaur National Monument and another in Cedar Breaks National Monument.

Changes to the flora of each park are summarized in the following section.

Arches National Park

Rebecca Weissinger first noticed an unusual plant in the Sleepy Hollow area of Arches National Park. In July 2009 Mary Moran collected the mystery plant while conducting monthly spring monitoring (Figure 1). The "Sleepy Hollow vine" is characterized by hastate-shaped leaves and a vine-like growth form, but unfortunately did not have flowers. The specimen is tentatively identified as Western hedge bindweed (*Calystegia sepium* var. *angulata*) in the morning-glory family (Convolvulaceae) though it could possibly be Maurandya (*Maurandya antirrhinflora*) in the figwort family (Scrophulariaceae) (Table 1). Neither species has previously been documented in Arches National Park (Fertig et al. 2009a) or Grand County, Utah (Welsh et al. 2008). Hedge bindweed is often considered non-native (Welsh et al. 2008), but the western variety *angulata* is probably native in western North America (Cronquist et al. 1984). Maurandya is primarily a southwestern desert species that is known in Utah only from Washington County. The wetland site where the "Sleepy Hollow vine" occurs is visited monthly by Arches personnel to measure spring flow and a flowering specimen will be sought in 2010 to confirm its identification.

Table 1. New Vascular Plant Taxa Confirmed or Reported for NCPN Park Units in 2009

Family	Species	Synonyms	Common Name	Life form	Range	Park	Status	Pop Size	Source and Year	Comments
Aceraceae	*Acer grandidentatum*		Bigtooth maple	Tree	Wide	CEBR	Pres	Unc	Fertig 25115 (CEBR). 2009.	Previously on Potential list for CEBR
Amaranthaceae	*Amaranthus retroflexus*		Redroot pigweed	AnnF	Intro	ZION	Pres	Unc	Fertig 25219 (ZION). 2009.	Previously on Potential list for ZION. Native to Central America
Asclepiadaceae	*Asclepias erosa*		Desert milkweed	PerF	Periph	ZION	Pres	Rare	Fertig 24650 (ZION). 2009.	New for ZION
Boraginaceae	*Cryptantha circumscissa*		Cushion cryptanth	AnnF	Wide	ZION	Pres	Unc	Meszaros 107 (ZION). 2009	Previously on Potential list for ZION
Boraginaceae	*Lappula occidentalis* var. *occidentalis*	*L. redowskii* var. *redowskii*	Western stickseed	AnnF	Wide	CEBR	Pres	Rare	Fertig, Holmgren, & Holmgren 25071 (CEBR). 2009.	New for CEBR. First record for Iron County, UT
Caryophyllaceae	*Holosteum umbellatum*		Holosteum	AnnF	Intro	ZION	Pres	Rare	Fertig 24566 (ZION) 2009.	First record for Washington Co, UT and ZION. Native to Europe.
Caryophyllaceae	*Stellaria umbellata*		Umbrella starwort	PerF	Wide	CEBR	Pres	Unc	Topp ST08060901 (CEBR). 2009.	Previously on Potential list for CEBR
Chenopodiaceae	*Bassia prostrata*	*Kochia prostrata*	Prostrate kochia, Forage kochia	Shrub	Intro	ZION	Pres	Unc	Meszaros 191 (ZION). 2009.	New for ZION. Native to Eurasia
Chenopodiaceae	*Bassia scoparia*	*Kochia scoparia*	Summer-cypress	AnnF	Intro	ZION	Pres	Unc	Fertig, Fertig, Decker, Mann, & Lieberg 23277 (ZION) 2007; Meszaros 188 (ZION) 2009	New for ZION. Accidently left off Fertig & Alexander (2009) list. Native to Eurasia.

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Chenopodiaceae	*Corispermum americanum*	Includes vars. *americanum & rydbergii*	American bugseed	AnnF	Wide	ZION	Pres	Rare	Fertig 25220 (ZION). 2009.	Previously on Potential list for ZION
Chenopodiaceae (Sarcobataceae)	*Sarcobatus vermiculatus*		Greasewood	Shrub	Wide	ZION	Pres	Unc	Fertig, Kingsley, and Gaienne 24608 (ZION). 2009.	Previously on Potential list for ZION
Compositae (Asteraceae)	*Acourtia wrightii*	*Perezia wrightii*	Wright's perezia	PerF	Periph	ZION	Pres	Unc	Meszaros 048 (ZION). 2009.	Previously on Potential list for ZION
Compositae (Asteraceae)	*Artemisia nova* var. *nova*	*A. arbuscula* var. *nova, Seriphidium novum*	Black sagebrush	Shrub	Wide	TICA	Rep	NA	Williams observation in 2007.	New for TICA. Corroboration needed
Compositae (Asteraceae)	*Baileya pleniradiata*		Woolly desert-marigold	AnnF	Wide	ZION	Pres	Unc	Carvella s.n. (ZION). 2007.	Previously on Falsely Reported list for ZION.
Compositae (Asteraceae)	*Bidens cernua*		Nodding bur-marigold	PerF	Wide	DINO	Pres	Unc	Topp ST01180906 (DINO). 2009.	Previously on Potential list for DINO (found on Colorado side)
Compositae (Asteraceae)	*Cirsium vulgare*		Bull thistle	PerF	Intro	CEBR	Pres	Rare	Fertig 25129 (CEBR). 2009.	Previously on Potential list for CEBR. Native to Europe.
Compositae (Asteraceae)	*Filago californica*	*Logfia californica, L. filaginoides*	Fluffweed	AnnF	Periph	ZION	Pres	Unc	Meszaros 034 (ZION). 2009.	New for ZION
Compositae (Asteraceae)	*Glyptopleura marginata*		Crustweed	AnnF	Wide	BLCA	Pres	Unc	Crook TC07250901 (BLCA). 2009.	New for BLCA. First report for Colorado?
Compositae (Asteraceae)	*Haplopappus armerioides* var. *armerioides*	*Stenotus armerioides* var. *armerioides*	Thrift goldenweed	PerF	Wide	ZION	Pres	Unc	Fertig 24585 (ZION). 2009.	New for ZION

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Compositae (Asteraceae)	*Helianthus nuttallii*		Nuttall's sunflower	PerF	Wide	ZION	Pres	Rare	Fertig, Fertig, & Decker 23273 (ZION). 2007.	Previously on Potential list for ZION. Accidently left off Fertig & Alexander (2009) list
Compositae (Asteraceae)	*Lactuca serriola*		Prickly lettuce	AnnF	Intro	CEBR	Pres	Unc	Fertig 25130 (CEBR). 2009.	New for CEBR. Native to Europe
Compositae (Asteraceae)	*Machaeranthera canescens* var. *canescens*	*Aster canescens, Dieteria canescens* var. *canescens*	Hoary aster	PerF	Wide	ZION	Pres	Unc	Fertig 25278 (ZION) 2009.	Previously on Potential list for ZION
Compositae (Asteraceae)	*Sonchus oleraceus*		Common sowthistle	AnnF	Intro	ZION	Pres	Unc	Carvella s.n. (ZION). 2007.	New for ZION. Native to Europe.
Convolvulaceae	*Calystegia sepium* var. *angulata*		Western hedge bindweed	PerF	Wide	ARCH	Pres	Rare	Moran photo (see page 12) from 2009	New for ARCH. Confirmation needed once flowers are available.
Cruciferae (Brassicaceae)	*Alyssum desertorum*		Desert madwort	AnnF	Intro	ZION	Pres	Unc	Fertig 24465 (ZION). 2009.	First record for Washington Co, UT and ZION. Native to Europe.
Cruciferae (Brassicaceae)	*Alyssum parviflorum* var. *micranthum*	*A. minus* var. *micranthum, A. simplex*	European madwort	AnnF	Intro	ZION	Pres	Rare	Fertig 24564 (ZION). 2009.	First record for Washington Co, UT and ZION. Native to Eurasia.
Cruciferae (Brassicaceae)	*Rorippa tenerrima*		Low yellowcress	AnnF	Wide	DINO	Pres	Unc	Topp ST08180908 (DINO). 2009	Previously on potential list for DINO (found on Colorado side)
Cyperaceae	*Carex capillaris*		Hair sedge	PerG	Wide	CEBR	Pres	Rare	Fertig 25118 (CEBR). 2009.	Previously on Potential list for CEBR

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Cyperaceae	*Eleocharis rostellata*		Beaked spikerush	PerG	Wide	ZION	Pres	Unc	Fertig et al. 23283 (ZION). 2007.	Accidently left off Fertig & Alexander (2009) list
Cyperaceae	*Lipocarpha aristulata*	*L. drummondii, Hemicarpha drummondii, H. micrantha*	Slender-rush	AnnG	Periph	ZION	Pres	Rare	Shorrock s.n. (ZION). 2004	New for ZION and Washington Co., UT
Gramineae (Poaceae)	*Avena fatua* var. *fatua*	*A. fatua*	Wild oats	AnnG	Intro	ZION	Pres	Rare	Meszaros 141 (ZION). 2009.	New for ZION. Native to Eurasia.
Gramineae (Poaceae)	*Bothriochloa ischaemum*	*B. ischaemum* var. *songarica*	Yellow bluestem	PerG	Intro	NABR	Pres	Rare	Moran s.n. (NABR). 2009.	New for NABR. Native to Eurasia.
Gramineae (Poaceae)	*Bromus trinii*	*B. berteroanus*	Chilean chess	AnnG	Intro	ZION	Pres	Unc	Meszaros 041 (ZION). 2009.	New for ZION. Native to South America
Gramineae (Poaceae)	*Crypsis alopecuroides*		Pricklegrass	AnnG	Intro	DINO	Pres	Unc	Topp ST08180903 (DINO). 2009.	New for DINO (on Colorado side). Native to Eurasia
Gramineae (Poaceae)	*Eragrostis hypnoides*		Teal lovegrass	AnnG	Periph	DINO	Pres	Unc	Topp ST08180902 (DINO). 2009.	New for DINO (on Colorado side)
Gramineae (Poaceae)	*Festuca pratensis*	*Lolium pratense, Schedonorus pratensis*	Meadow fescue	PerG	Intro	CARE	Pres	Unc	Weissinger 06290901 (CARE). 2009.	Previously on Falsely reported list for CARE. Native to Eurasia
Gramineae (Poaceae)	*Sorghum bicolor*		Grain sorghum	PerG	Intro	ZION	Pres	Unc	Franzone s.n. (ZION). 2007.	New for ZION. Native to Eurasia
Hydrophyllaceae	*Eucrypta micrantha*		Desert eucrypta	AnnF	Periph	ZION	Pres	Unc	Meszaros 052 (ZION). 2009.	Previously on Potential list for ZION

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Hydrophyllaceae	*Phacelia affinis*		Twin phacelia	AnnF	Periph	ZION	Pres	Rare	Meszaros s.n. (ZION). 2009.	Previously on Falsely reported list for ZION
Leguminosae (Fabaceae)	*Astragalus convallarius* var. *finitimus*		Enterprise milk-vetch	PerF	RegEn	ZION	Pres	Rare	McDaniel FX-138 (ZION working herbarium). 2001.	New for ZION. Type locality 3 miles S of Enterprise, Washington Co., UT (*Ripley & Barneby 4967* RSA). USFWS: 3C
Leguminosae (Fabaceae)	*Lathyrus eucosmus*	*L. brachycalyx* var. *eucosmus*	Seemly sweetpea	PerF	Sparse	BLCA	Rep	NA	Observed in BLCA by Trista Crook in 2009.	Previously on Potential list for BLCA
Leguminosae (Fabaceae)	*Trifolium hybridum*		Alsike clover	PerF	Intro	DINO	Pres	Unc	Topp ST08180901 (DINO). 2009.	New for DINO (on Colorado side)
Liliaceae (Calochortaceae)	*Disporum trachycarpum*	*Prosartes trachycarpa*	Rough-fruit fairy-bells	PerF	Wide	CEBR	Pres	Unc	Fertig 25116 (CEBR). 2009.	Previously on Potential list for CEBR
Melanthiaceae (Liliaceae)	*Veratrum tenuipetalum*	*V. californicum*	False hellebore	PerF	Wide	CURE	Rep	NA	Observed in CURE by S. Topp in 2009 but not collected	New for CURE
Onagraceae	*Camissonia brevipes*		Showy camissonia	AnnF	Periph	ZION	Pres	Unc	Meszaros 096 (ZION). 2009.	Previously on Falsely reported list for ZION
Onagraceae	*Epilobium brachycarpum*	*E. paniculatum*	Autumn willow-herb	AnnF	Wide	CEBR	Pres	Unc	Fertig 25131 (CEBR). 2009.	Previously on Potential list for CEBR
Ophioglossaceae	*Botrychium lunaria*		Moonwort	Fern	Sparse	CEBR	Pres	Rare	Fertig photo (Fertig 2009g). 2009	New for CEBR
Orchidaceae	*Epipactis gigantea*		Giant helleborine	PerF	Wide	CEBR	Pres	Rare	Fertig 24768 (CEBR). 2009.	New for CEBR

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Polemoniaceae	*Ipomopsis aggregata* var. *macrosiphon*	*Gilia aggregata* var. *macrosiphon*	Scarlet gilia	PerF	Wide	ZION	Rep	NA	Louie s.n. (ZION). Year not known	New for ZION. Collection reported by M. Malm
Polygonaceae	*Eriogonum cernuum* var. *psammophilum*	Var. not recognized in FNA	Sand dune nodding wild buckwheat	AnnF	LocEn	ZION	Pres	Rare	Fertig 25222 (ZION). 2009.	New for ZION. Type locality 1.5 miles N of Orderville, Kane Co, UT (*Welsh & Thorne 13023* BRY)
Polygonaceae	*Eriogonum inflatum* var. *fusiforme*	*E. fusiforme*	Grand Valley desert trumpet	AnnF	RegEn	ZION	Pres	Unc	Fertig 24641 (ZION). 2009.	New for ZION
Ranunculaceae	*Actaea rubra*	*A. rubra* ssp. *arguta*	Red baneberry	PerF	Wide	CEBR	Pres	Unc	Fertig 25117 (CEBR). 2009.	New for CEBR
Rosaceae	*Potentilla norvegica*		Norwegian cinquefoil	AnnF	Intro	DINO	Pres	Unc	Topp ST01180905 (DINO). 2009.	Previously on Falsely reported list for DINO. Native to Europe and possibly E North America
Rosaceae	*Rubus discolor*	*R. armeniacus*	Himalayan blackberry	Shrub	Intro	ZION	Rep	Rare	Reported by Joel Silverman from South Campground	New for ZION. Native to Eurasia
Saxifragaceae (Grossulariaceae)	*Ribes viscosissimum* var. *viscosissimum*		Sticky currant	Shrub	Wide	ZION	Pres	Unc	Decker 26 (ZION). 2008.	New for ZION.
Ulmaceae	*Celtis occidentalis*		Common hackberry	Tree	Intro	ZION	Pres	Rare	ZION Working Herbarium (collector & date not provided)	New for ZION. Native to E. North America
Urticaceae	*Urtica dioica*		Stinging nettle	PerF	Wide?	ZION	Rep	?	Observed by Margaret Malm at spring by Wildcat Canyon Trail	New for ZION. Variety not determined

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Family and species nomenclature follows Welsh et al. (2008) for Utah and Weber and Wittmann (2001) for Colorado parks.

Life form: AnnF = Annual Forb (non-woody broad-leaved plants that complete their life cycle in one year), AnnG = Annual Graminoid (grass-like plants that complete their life cycle in one year), Fern = Ferns and fern-allies (non-flowering vascular plants that reproduce by spores), PerF = Perennial Forb (non-woody broad-leaved plants that live for multiple years), PerG = Perennial Graminoid (grass-like plants that live for multiple years), Shrub (woody perennials with one to many trunks and usually less than 3.5 m tall), Tree (woody perennials with a single stem or trunk over 3.5 m tall).

Range: Disj = Disjunct (taxa with their in-state distribution separated from their main, contiguous range by a gap of more than 800 km or 500 miles), Intro = Introduced (non-native or exotic), LocEn = Local Endemic (taxa with their entire global range restricted to an area of less than 16,500 square km or 1 degree of latitude x 2 degrees of longitude), Periph = Peripheral (taxa that are widespread globally but occur at the margin of their contiguous range within a state), RegEn = Regional Endemic (taxa with a global range of 16,500-250,000 square km (an area about the size of the state of Wyoming), Wide = Widespread (taxa have global ranges exceeding 250,000 square km and occur over at least 10% of the state).

Park: park acronyms are ARCH (Arches NP), BLCA (Black Canyon of the Gunnison National Park), CARE (Capitol Reef National Park), CEBR (Cedar Breaks National Monument), CURE (Curecanti National Recreation Area), DINO (Dinosaur National Monument), NABR (Natural Bridges National Monument), TICA (Timpanogos Cave National Monument), ZION (Zion National Park).

Status: Pres = Present (confirmed with a voucher), Rep = Reported (cited for park in literature or based on a reliable observation, but without a voucher)

Pop. Size (population size): Com = Common, Rare = Rare, Unc = Uncommon, Unk = Unknown.

Source and Year: Literature reference or collector/collection number (and repository) for voucher specimen of species in park and year when newly documented.

Comments: Supplemental information on significance of discovery, continent of origin for introduced species, type locality, etc.

Figure 1. "Sleepy Hollow vine" collected in vegetative condition from a wetland in Arches National Park by Mary Moran in July 2009. The plant is either *Calystegia sepium* var. *angulata* or *Maurandya antirrhiniflora*. Either species would be an addition to the park's flora. Efforts will be made to secure a flowering specimen in 2010. Photo by Mary Moran.

Two additional species of annual *Atriplex* were observed in Arches in the summer of 2009, but no vouchers were collected for confirmation. Mary Moran believes the observations may represent Stalked orach (*Atriplex saccaria*), Thinleaf orach (*A. prostrata*), or Silver orach (*A. argentea*), none of which have previously been reported. Flowering and fruiting material needs to be collected in 2010 before these new species reports can be confirmed. For now, none of these *Atriplex* taxa have been formally added to the park checklist.

With new discoveries from 2008 and 2009, the total vascular plant flora of Arches National Park stands at 524 taxa (including full species and distinct varieties and subspecies), of which 448 are native (Fertig et al. 2009, 2009a).

Black Canyon of the Gunnison National Park

In 2009, Trista Crook of the Northern Colorado Plateau Network reported two new species for the park while working on a vegetation monitoring project. Seemly sweetpea (*Lathyrus eucosmus*) in the pea family (Leguminosae or Fabaceae) was previously on the park's potential species list (Hogan et al. 2009a) before being observed (but not collected) in 2009. Crook collected a voucher of Crustweed (*Glyptopleura marginata*) in the sunflower family (Compositae or Asteraceae) that was identified by her colleague Sarah Topp. This specimen represents a first record for the state of Colorado. With these discoveries, the known flora of Black Canyon has increased to 534 taxa, of which 461 are native (Hogan et al. 2009a).

Table 2. Changes in Status for Vascular Plant Taxa Previously Cited as Historical or Reported for NCPN Park Units in 2009

Family	Species	Synonyms	Common Name	Life form	Range	Park	Status	Pop Size	Source	Comments
Cactaceae	*Coryphantha vivipara* var. *arizonica*	*Escobaria vivipara* var. *arizonica*. Vars not recognized in Flora of North America (2003)	Arizona pincushion	PerF	Wide	ZION	Pres	Rare	Fertig, Decker, & Ivans 25201 (ZION). 2009.	Previously listed as Reported for ZION. Confirmation needed of variety.
Cactaceae	*Echinocereus triglochidiatus* var. *mojavensis*	Variety not recognized in Flora of North America (2003)	Mohave claretcup	PerF	Periph	ZION	Pres	Rare	Fertig 25333 (ZION). 2009.	Previously listed as Reported for ZION
Compositae (Asteraceae)	*Artemisia tridentata* var. *vaseyana*	*Seriphidium vaseyanum*, includes *A. tridentata* var. *pauciflora*	Mountain big sagebrush	Shrub	Wide	ZION	Pres	Unc	Fertig 25273 (ZION). 2009.	Previously listed as Reported for ZION
Compositae (Asteraceae)	*Crepis occidentalis* var. *occidentalis*	*Psilochenia occidentalis*	Western hawksbeard	PerF	Wide	ZION	Pres	Unc	Nielsen 725 (ZION). 2008.	Previously listed as Reported for ZION
Cruciferae (Brassicaceae)	*Arabis demissa*	*Boechera demissa* var. *languida, B. demissa* var. *demissa, B. oxylobula*	Nodding rock cress	PerF	Wide	ZION	Pres	Unc	Fertig 24718 (ZION). 2009.	Previously listed as Historical for ZION
Cruciferae (Brassicaceae)	*Brassica campestris*	*B. rapa, B. napus*	Field mustard	AnnF	Intro	ZION	Pres	Unc	2001 collection from Zion NP visitor center (ZION working herbarium, collector not indicated)	Previously listed as Historical for ZION
Cruciferae (Brassicaceae)	*Lepidium lasiocarpum* var. *georginum*		St. George pepperwort	AnnF	Wide	ZION	Pres	Unc	Fertig 24670 (ZION). 2009.	Previously listed as Reported for ZION.
Cruciferae (Brassicaceae)	*Lepidium montanum* var. *montanum*		Mountain pepperwort	PerF	Wide	ZION	Pres	Unc	Fertig 24633 (ZION). 2009.	Previously listed as Historical for ZION
Gramineae (Poaceae)	*Distichlis spicata*	*D. spicata* var. *stricta, D. stricta*	Desert saltgrass	PerG	Wide	ZION	Pres	Unc	Fertig 24647 (ZION). 2009.	Previously listed as Reported for ZION.

See Table 1, page 11 for explanation of codes.

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Family	Species	Synonyms	Common Name	Life form	Range	Park	Status	Pop Size	Source	Comments
Gramineae (Poaceae)	*Elymus repens*	*Agropyron repens, Elytrigia repens*	Quackgrass	PerG	Intro	ZION	Pres	Unc	Fertig, Fertig, Mann, & Lieberg 23280 (ZION). 2007	Previously listed as Reported for ZION
Leguminosae (Fabaceae)	*Lotus rigidus*		Bush trefoil	PerF	Periph	ZION	Pres	Unc	Meszaros 112 (ZION). 2009.	Previously listed as Reported for ZION
Liliaceae (Alliaceae)	*Allium bisceptrum*	Includes vars. *bisceptrum & palmeri*	Twincrest onion	PerF	Wide	CEBR	Pres	Unc	Bill Gray observation and photo in 2009	Previously listed as Historical for CEBR
Onagraceae	*Oenothera albicaulis*		White-stem evening-primrose	AnnF	Wide	ZION	Pres	Unc	Meszaros 122 (ZION). 2009.	Previously listed as Historical for ZION
Polygonaceae	*Rumex maritimus* var. *fueginus*	*R. fueginus*	Golden dock	AnnF	Wide	DINO	Pres	Unc	Topp ST08180904 (DINO). 2009.	Previously listed as Historical for DINO
Polygonaceae	*Rumex salicifolius*	*R. mexicanus, R. triangulivalvis;* includes vars *triangulivalvis & mexicanus*	Willow dock	PerF	Wide	ZION	Pres	Unc	Decker 32 (ZION). 2008.	Previously listed as Historical for ZION.
						DINO	Pres	Unc	Topp ST08180907 (DINO). 2009.	Previously listed as Historical for DINO
Polypodiaceae	*Polystichum scopulinum*		Rock holly-fern	Fern	Wide	ZION	Pres	Unc	Steve McKee photo (see cover) from Spry Canyon. 2007	Previously listed as Historical for ZION
Ranunculaceae	*Myosurus cupulatus*		Horseshoe mousetail	AnnF	Wide	ZION	Pres	Unc	Meszaros 058 (ZION). 2009.	Previously listed as Reported for ZION
Rhamnaceae	*Ceanothus greggii* var. *vestitus*		Mojave desert-lilac	Shrub	Periph	ZION	Pres	Unc	Fertig 25327 (ZION). 2009.	Previously listed as Reported for ZION
Umbelliferae (Apiaceae)	*Berula erecta* var. *incisa*		Cutleaf water-parsnip	PerF	Wide	ZION	Pres	Rare	Fertig observation along River Walk trail in Zion Narrows, June 2009	Previously listed as Historical for ZION

Capitol Reef National Park

Rebecca Weissinger collected Meadow fescue (*Festuca pratensis*) in Capitol Reef National Park in 2009 while conducting a vegetation monitoring study. Previously, this species had been considered falsely reported, based on a misidentified specimen in the CARE herbarium (Fertig 2009a). Meadow fescue is an introduced perennial grass originating in Eurasia. With the addition of this species, the number of non-native plant taxa in Capitol Reef increases to 123 and the total flora now stands at 889 (Fertig 2009a, Fertig et al. 2009).

Cedar Breaks National Monument

As previously reported by Fertig (2009g), 11 new vascular plant species were discovered in Cedar Breaks National Monument in 2009 (Table 1) and one historical species was relocated (Table 2). Umbrella starwort (*Stellaria umbellata*) was documented by Sarah Topp while doing plot work associated with vegetation monitoring. Retired University of Utah professor Bill Gray relocated an historical population of Twincrest onion (*Allium bisceptrum*) near the monument picnic area during a Utah Native Plant Society field trip in July 2009. Fertig (2009g) recorded 10 new species for the monument while conducting rare plant surveys along the rim of the Cedar Breaks Amphitheater and in the bottom of Ashdown Canyon (Table 1). Among the more notable finds were Moonwort (*Botrychium lunaria*) and Giant helleborine (*Epipactis gigantea*). At least six native wetland species were found in the Ashdown Canyon section of the monument, suggesting that this area remains incompletely explored. With all of these additions, the total number of plant taxa known for the monument has now reached 365 (Table 3), of which 345 are native (Fertig 2009b, 2009g).

While visiting the Southern Utah University herbarium in July 2009, Walter Fertig found several historical collections of Cedar Breaks plants from the late 1920s and early 1930s. These specimens were made by Forest Service employees before Cedar Breaks gained National Monument status in 1933 and are among the earliest known for the area. The following seven CEBR species are now known from first collections that pre-date those cited in Fertig 2009b (the status of each species in the monument remains unchanged from the 2009 annotated checklist):

Compositae (Asteraceae): *Senecio atratus* (Black groundsel). Orange A. Olsen # 375 (SUU) collected in 1930 (previous earliest date was 1934).

Geraniaceae: *Geranium richardsonii* (Richardson's crane's-bill). F.W. Seaman # 52 (SUU) collected in 1927 (previous earliest date was 1970)

Polemoniaceae: *Ipomopsis tridactyla* (Cedar Breaks gilia). Orange A. Olsen # 342 (SUU) collected in 1928 (previous earliest date was 1935).

Phlox pulvinata (Cushion phlox). Orange A. Olsen # 339 (SUU) collected in 1928 (previous earliest date was 1940).

Table 3. Revised Statistical Summary of the Flora of Cedar Breaks National Monument (updated from Fertig 2009g). The number of taxa and families is based on taxonomic concepts of Welsh et al. (2008).

Flora of Cedar Breaks National Monument	Present or Historical in Park	Reported for Park	Total
Taxonomic Diversity			
Total # of Taxa (including varieties and sub-species)	358	7	365
# of Full Species (excluding varieties and subspecies)	346	5	351
# of Families	57	0	57
Life Form Diversity			
# of Tree Taxa	15	1	16
# of Shrub Taxa	36	1	37
# of Perennial Forb Taxa	208	3	211
# of Annual Forb Taxa	13	1	14
# of Perennial Graminoid Taxa	72	1	73
# of Annual Graminoid Taxa	3	0	3
# of Fern Taxa	8	0	8
Biogeographic Diversity			
# of Introduced Taxa	19	1	20
# of Locally Endemic Taxa	18	0	18
# of Regionally Endemic Taxa	20	0	20
# of Disjunct Taxa	2	0	2
# of Peripheral Taxa	0	0	0
# of Sparse Taxa	7	0	7
# of Widespread Taxa	292	6	298
Total # Native Taxa	339	6	345*

*Erroneously cited as 344 in Fertig 2009g.

Umbelliferae (Apiaceae): *Ligusticum porteri* (Southern ligusticum). F.W. Seaman # 123 (SUU) collected in 1930 (previous earliest date was 1935).

Lomatium minimum (Least lomatium). Orange A. Olsen # 340 (SUU) collected in 1928 (previous earliest date was 1935)

Osmorhiza depauperata (Blunt sweet-cicely). F.W. Seaman # 122 (SUU) collected in 1930 (previous earliest date was 1979).

Colorado National Monument

No new species were documented in Colorado National Monument in 2009. While updating the NPSpecies database for the monument, David Svendson of the Northern Colorado Plateau Network found some discrepancies in the status of several species cited in Hogan et al. (2009). The following corrections need to be made to the lists of potential species (Appendix B) and falsely reported plants (Appendix C) from that document:

Asteraceae: *Sonchus asper* (Spiny-leaf sow-thistle) is present in the monument (page 31) and should be deleted from Appendix B (page 69)

Stephanomeria pauciflora (Brown-plume wire-lettuce) is reported (page 31) for the monument by Von Loh et al. (2007) and should be deleted from Appendix C (page 83)

Fabaceae: *Astragalus pattersonii* (Patterson's milkvetch) is falsely reported (page 84) and should be deleted from the potential list in Appendix B (page 74)

Juncaceae: *Juncus nodosus* (Knotted rush) is falsely reported (page 85) and should be deleted from Appendix B page 75)

Melianthaceae (Liliaceae): *Toxicoscordion venenosum* or *Zigadenus venenosus* (Meadow death camas) is present in the monument (page 47) and should be dropped from the falsely reported list (page 85)

Orchidaceae: *Limnorchis hyperborea* or *Habenaria hyperborea* (Northern bog orchid) is reported for the monument in Appendix A (page 49) by Von Loh et al. (2007) and should be dropped from Appendix C (page 86)

Polemoniaceae: *Gilia leptomeria* (Common gilia) is falsely reported (page 86) and should be dropped from Appendix B (page 79)

Typhaceae: *Typha domingensis* (Southern cattail) is reported (page 63) for the monument by Von Loh et al. (2007) and should be dropped from Appendix C (page 87).

These corrections do not affect the number of vascular plant taxa confirmed and reported for Colorado National Monument, which still stands at 467. The number of

potential species should drop from 296 to 292 and the number of falsely reported taxa drops from 36 to 32 (Hogan et al. 2009).

Curecanti National Recreation Area

While conducting field work in association with a vegetation monitoring project, network botanist Sarah Topp observed (but did not collect) *Veratrum tenuipetalum* (*V. californicum*), a species previously not reported for Curecanti National Recreation Area (Table 1). With the discovery of this member of the Melanthiaceae (a segregate family of the Liliaceae recognized in Colorado) the number of plant taxa confirmed and reported for the recreation area increases to 680 (Hogan et al. 2009b).

Dinosaur National Monument

Sarah Topp discovered 6 new species for Dinosaur National Monument in 2009 and relocated two species that had previously been considered historical (Fertig 2009c) (Tables 1, 2). All the collections came from the Laddie Park area of the Yampa River above its confluence with the Green River on the Colorado side of the monument. One of the new species, Norwegian cinquefoil (*Potentilla norvegica*), had formerly been considered as falsely reported for the monument. This species, along with Pricklegrass (*Crypsis alopecuroides*), and Alsike clover (*Trifolium hybridum*) are exotics and increase the monument's non-native flora to 81 species (Fertig 2009c).

With these new discoveries, the known flora of Dinosaur National Monument now contains 763 confirmed and reported plant taxa. Of these, 598 occur in the Colorado portion and 485 on the Utah side of the monument (Fertig 2009c, Fertig et al. 2009).

Natural Bridges National Monument

Mary Moran documented the introduced grass Yellow bluestem (*Bothriochloa ischaemum*) from the Owachomo Overlook area of Natural Bridges National Monument in June 2009 (Table 1). This native of Eurasia is the 47th non-native species to be found in the monument and the 429th species overall (Fertig 2009f).

Timpanogos Cave National Monument

In 2007, Pete Williams of the Northern Colorado Plateau Network's vegetation mapping crew reported Black sagebrush (*Artemisia nova* var. *nova*) for the flora of Timpanogos Cave National Monument (Table 1). This species has not previously been documented for the monument and would increase the area's known flora to 236 taxa (Fertig and Atwood 2009). Williams did not collect a voucher specimen, so this record is considered "reported" rather than "confirmed" at present.

Zion National Park

Despite over a century of botanical exploration, the flora of Zion National Park continues to expand as a result of ongoing rare plant surveys, floristic studies, and monitoring associated with recent wildfires. In 2009, 21 new species were discovered in the park and 12 other new taxa came to light from examination of herbarium specimens made from 2001-2008 (Table 1). Another 17 species that were formerly considered historical or which had been reported without vouchers were confirmed as present (Table 2). In all, the flora of Zion National Park has had a net increase of 32 species in the past year* and has grown by three percent. The revised flora of the park now contains 1023 confirmed and reported vascular plant species (Table 4). Zion has surpassed Grand Staircase-Escalante National Monument as the Utah park with the highest vascular plant species richness (Fertig and Alexander 2009, Fertig 2009h).

Twelve of the new species documented in 2009 are exotic plants, giving the park 152 non-native species (Table 4). Many of these were discovered by Ryan Meszaros and colleagues from Northern Arizona University while working on post-fire monitoring projects in the Crater Hill and Kolob Terrace areas of Zion National Park from 2007-2009. Exotic species found in the Crater Hill burn include Forage kochia (*Bassia prostrata*), Common sow-thistle (*Sonchus oleraceus*), Wild oats (*Avena fatua* var. *fatua*), Chilean chess (*Bromus trinii* or *B. berteroanus*), and Grain sorghum (*Sorghum bicolor*). Walter Fertig found Redroot pigweed (*Amaranthus retroflexus*) in the East Entrance burn area and Holosteum (*Holosteum umbellatum*), Desert madwort (*Alyssum desertorum*) and European madwort (*A. parviflorum* var. *micranthum*) along the Pine Creek and East Rim trails. Zion vegetation management and fire effects staff identified populations of Common hackberry (*Celtis occidentalis*) and Himalayan blackberry (*Rubus discolor*) below the main tunnel and at the South Campground.

The majority of new native taxa for Zion were discovered in the Mohave-influenced southwest corner of the park and in the Kolob Terrace area. New species from these sites include Desert milkweed (*Asclepias erosa*), Wright's perezia (*Acourtia wrightii*), Woolly desert-marigold (*Baileya pleniradiata*), Fluffweed (*Filago californica*), Greasewood (*Sarcobatus vermiculatus*), Desert eucrypta (*Eucrypta micrantha*), Twin phacelia (*Phacelia affinis*), Showy camissonia (*Camissonia brevipes*), and Grand Valley desert trumpet (*Eriogonum inflatum* var. *fusiforme*). Several historical and reported species were rediscovered in this same general area in 2009, including Arizona pincushion cactus (*Coryphantha vivipara* var. *arizonica,* Figure 2), St. George pepperwort (*Lepidium lasiocarpum* var. *georginum*), Desert saltgrass (*Distichlis spicata*), Bush trefoil (*Lotus rigidus*), White-stem evening-primrose (*Oenothera albicaulis*), and Horseshoe mousetail (*Myosurus cupulatus*). Additional historical species have recently been relocated in Spry Canyon (*Polystichum scopulinum* by Steve McKee), along the Virgin River Narrows Trail (*Berula erecta* var. *incisa*), and the West Rim Trail (*Arabis demissa*).

*One species, Ward's bladderpod (*Physaria wardii*) in the mustard family (Cruciferae or Brassicaceae) is now considered to be conspecific with King's bladderpod (*P. kingii*) and should be deleted from the park's checklist (Welsh et al. 2008).

Table 4. Revised Statistical Summary of the Flora of Zion National Park. This table updates Table 3.1 from Fertig and Alexander (2009) and reflects new species discovered or relocated in 2009. The number of taxa and families is based on taxonomic concepts of Welsh et al. (2008).

Flora of Zion National Park	Present or Historical in Park	Reported for Park	Total
Taxonomic Diversity			
Total # of Taxa (including varieties and subspecies)	981	42	1023
# of Full Species (excluding varieties and subspecies)	921	38	959
# of Families	98	0	98
Life Form Diversity			
# of Tree Taxa	37	3	40
# of Shrub Taxa	123	9	132
# of Perennial Forb Taxa	445	17	462
# of Annual Forb Taxa	196	7	203
# of Perennial Graminoid Taxa	120	5	125
# of Annual Graminoid Taxa	34	1	35
# of Fern Taxa	26	0	26
Biogeographic Diversity			
# of Introduced Taxa	140	12	152
# of Locally Endemic Taxa	43	2	45
# of Regionally Endemic Taxa	86	4	90
# of Disjunct Taxa	4	1	5
# of Peripheral Taxa	101	4	105
# of Sparse Taxa	16	1	17
# of Widespread Taxa	591	18	609
Total # Native Taxa	841	30	871

Figure 2. *Coryphantha vivipara* from the vicinity of Crater Hill in Zion National Park, observed on 11 September 2009. Photo by W. Fertig.

Several rare species were newly documented or relocated in Zion National Park as a result of 2009 field and herbarium studies. Mohave claretcup (*Echinocereus triglochidiatus* var. *mojavensis*) was rediscovered several miles north of the Kolob Visitor Center in early October 2009 in an area being studied for a potential controlled burn. This species had previously been reported for the park by Trapp (1969), but the specimen in the ZION herbarium was thought to be misidentified (Fertig and Alexander 2009). An unidentified specimen of Enterprise milkvetch (*Astragalus convallarius* var. *finitimus*), a regional endemic of southwestern Utah, was discovered in the park's resource management herbarium. The collection was made in the Kolob Terrace area in 2001 by a park employee. Follow-up surveys are needed to determine its full distribution and abundance in the park.

Perhaps the most unusual discovery, however, was that of Slender-rush (*Lipocarpha aristulata*), an annual member of the sedge family (Cyperaceae). The collection was made by then-graduate student Donna Shorrock and was grown from seed collected in alluvial soil sampled along the North Fork of the Virgin River in 2004. The Zion specimen is only the third known from the state and is the first found in Washington County. The age of the seed and its original source remain unknown, though it is likely that it came from an undiscovered population of Slender-rush elsewhere in Zion Canyon.

One other species recently found in the Zion National Park working herbarium has not been added to the park's official flora. Creeping sorrel (*Oxalis corniculata*) is a ubiquitous agricultural weed found growing in the park's greenhouse. It has apparently not escaped from the greenhouse into the surrounding area and so is not considered part of the park's flora—yet.

Finally, a correction is needed for the Zion annotated checklist (Fertig and Alexander 2009). On page 119 we incorrectly stated that the type locality of *Selaginella utahensis* was "S. of St. George, Washington County, Utah" as cited in the original publication on the species (Flowers 1949). The actual location is "dry face of Lady Mountain, Zion National Park" as stated in Cronquist et al. (1972) and corrected by Flowers (1952). The original error in Flowers' 1949 paper was due to a typographical error.

Discussion

A total of 57 new species were documented in nine of the 16 park units in the Northern Colorado Plateau Network based on field surveys in 2009 and on-going data mining. Of these species, 51 are confirmed with herbarium vouchers or photographs and 6 are reliably reported, but unvouchered. Another 19 species that were formerly reported or considered historical were rediscovered in three network parks in 2009. More than half of the new species and rediscoveries were made in Zion National Park, increasing the known flora of the park by three percent. Although only 11 new species were found in Cedar Breaks National Monument, its total flora also increased by three percent.

Combined with new discoveries made in 2008, 117 new vascular plant species have been discovered in Northern Colorado Plateau Network parks since annotated check-lists were "completed" for all park units from 2004-2007 (Table 5). Revisions in

Table 5. Summary of Changes in the Floras of Northern Colorado Plateau Network Parks, 2008-2009.

Park Unit	# of New Species in 2008	# of New Species in 2009	# of Name Changes 2008-09	# of Changes in Park Status 2008-09	Total # of Changes 2008-09
Arches	2	1	12	0	15
Black Canyon of the Gunnison	0	2	0	0	2
Bryce Canyon	0	0	16	0	16
Canyonlands	5	0	15	1	21
Capitol Reef	1	1	21	0	23
Cedar Breaks	8	11	11	1	31
Colorado	0	0	0	8	8
Curecanti	1	1	0	0	2
Dinosaur	1	6	20	2	29
Fossil Butte	1	0	0	0	1
Golden Spike	5	0	7	0	12
Hovenweep	0	0	9	0	9
Natural Bridges	0	1	14	0	15
Pipe Spring	36	0	0	12	48
Timpanogos Cave	0	1	7	0	8
Zion	0	33	24	18	75
TOTAL	**60**	**57**	**156**	**42**	**315**

nomenclature have also been necessary for nearly 50 species (representing 156 occurrences in 11 of 16 parks). Other changes in status (from historical or reported to present) have affected 34 park records. In all, 315 updates have been necessary for every park unit in the network (Table 5).

The rapid rate of change in park floras in recent years underscores the importance of continued research and database management. Most of the new discoveries have arisen from field studies associated with fire impacts, surveys of rare species, weed inventories, and vegetation monitoring projects. Many important findings have also come from review of herbarium collections, including many unmounted specimens being kept by park staff. Other regional herbarium collections (such as those at Southern Utah University with early Cedar Breaks specimens) likely contain undocumented park data. New discoveries and ongoing changes in nomenclature and taxonomic relationships require a continued commitment to database management to ensure that species lists remain as current and accurate as possible. The work of the past two years demonstrates that inventory is still an important and incomplete component of the park service's Inventory and Monitoring program.

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